# THE IMPACT OF VIOLIN PLAYING TECHNIQUES SPECIFICALLY DESIGNED TO SIMULATE THE HUMAN VOICE ON ANXIETY REDUCTION OF COLLEGE STUDENTS

BY



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ABSTRACT

The purpose of this study was to determine the impact of the violin played with techniques specifically designed to simulate the human voice on anxiety reduction of college students prior to stressful events. This study attempted to answer the following questions: (a) Does listening to violin music that simulates the human singing voice decrease anxiety levels in healthy individuals? (b) Does violin music that simulates a singer's breath have a different effect on individuals' self-reported anxiety levels than violin music that does not simulate a singer's breath? Forty healthy undergraduate and graduate students participated in the study. Participants were assigned to the experimental or control group; assignments were predetermined based on the research schedules yet remained unknown to the participants. A one-way repeated-measures Analysis of Variance (ANOVA) was computed to analyze the between-participants factor (i.e., experimental and control conditions) and the within-participants factor (i.e., time of measurement). Results indicated a statistically significant main effect for Time, while the main effect for 'Group' and the interaction effect were not statistically significant. Although this research study was limited by small sample size, personal coping skills, and past experience associates with the violin timbre, the ability of violin music to effectively reduce anxiety is undeniable regardless of whether or not it simulated the human singing voice. The better we understand the therapeutic potential and benefits of this fascinating instrument, the more convincing it will be for music therapists to use the violin clinically. Therefore, future studies in this topic area are encouraged.

# DEDICATION

This thesis is dedicated to the memory of Professor Shi-Sheng Zheng (1936-2014), the late violin professor of Shanghai Conservatory of Music. Professor Zheng's unique approach in violin pedagogy and mentorship guided me to become a violinist with solid foundation, and a musician with a curious heart to seek new knowledge in all aspects.

ACKNOWLEDGEMENTS

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# CHAPTER I

## INTRODUCTION

Anxiety can be dichotomously categorized into state anxiety and trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). State anxiety is characterized by the transitory emotional state an individual interprets and reflects in regard to a particular stressful situation. Trait anxiety is a pervasive personality trait that manifests in overt behaviors and an increase in the frequency and severity of elevated state anxiety that an individual experiences over time (Buffum, Sasso, Sands, Lanier, Yellen, & Hayes, 2006; Spielberger et al., 1983). Cooper (2006) found that an increased level of anxiety, namely state anxiety, could significantly impact an individual's performance.

Many studies show that using one's voice is therapeutically effective in reducing anxiety (Bailey & Davidson, 2002; Clift, 2012; Clift & Hancox, 2010; Jacob, Guptill, & Sumsion, 2009; Kreutz, Bongard, Rohrmann, Hodapp, & Grebe, 2004; Tonneijck, Kinébanian, & Josephsson, 2008; Unwin, Kenny, & Davis, 2002); however, the intimacy of the human voice can be overwhelming for some individuals (Chong, 2010). Chong explicated that lower self-esteem, lack of self-consciousness and confidence with the sound quality of the individual's own voice are possible causes to inducing uncomfortable feelings. The clinical use of the violin may be able to bypass this potential obstacle to a therapeutic relationship while still accessing the clinical importance of the linear and melodic qualities afforded by the voice. This possible substitution should prompt exploration in terms of physiological and psychological responses to the violin as an agent for reducing anxiety. Due to the varying complex playing techniques of the

violin, it is important to define and articulate the role of each aspect of the technique and its therapeutic function. The clarification of the underlying theory of using violin will increase transparency and will benefit music therapy with stronger justifications for the violin's potential therapeutic effect.

**Overview of the Instrument: The Violin**

The violin is an endlessly fascinating instrument that has been around for several centuries. This frail-looking musical instrument has endured minimal structural changes across this time span, illustrating the perfection of its design, both as an expressive instrument of music and as a beautiful object in itself. Since 1564, Andrea Amati's (ca. 1505-1578) design and construction methods have become one of the primary blueprints for past and contemporary violin makers (Dilworth, 1992). Amati was credited as the pioneer luthier who formed the violin by perfecting the design of viola da braccio, which is an immediate predecessor to the violin from the Renaissance period. In 1710, another renowned Italian luthier, Antonio Stradivari (1644-1737), innovated the modern form of the violin by reducing the height of the front and back pieces, thus enhancing the tone quality (Dilworth, 1992).

The violin is a very complex artistic tool that consists of fifty-eight distinct parts (Beament, 1997; Dilworth, 1992; Otto, 1875), as indicated in Figure 1. Occasionally, over 70 different pieces of wood are put together to form a violin, depending on the number of purfling that is used, which varies from luthier to luthier.[1] Traditionally, a

[1] According to Jacob Augustus Otto (1875), 12 pieces of purfling are generally used to build a violin; however, Choron and La Fage's *Manuel de Musique* (1836) and Maugin's *Manuel du Luthier* (1834) both suggest 24 pieces for the purfling.

complete violin is made of three kinds of wood: maple, pine or white deal, and ebony. A specific kind of wood is used for specific parts of the violin in order to produce the best tone quality of the instrument. The wood for the front piece maintains the most importance for the production of a decent tone; it has to be cut during a particular time of year, between December and January, and only the south side of the tree is cut and used (Otto, 1875).

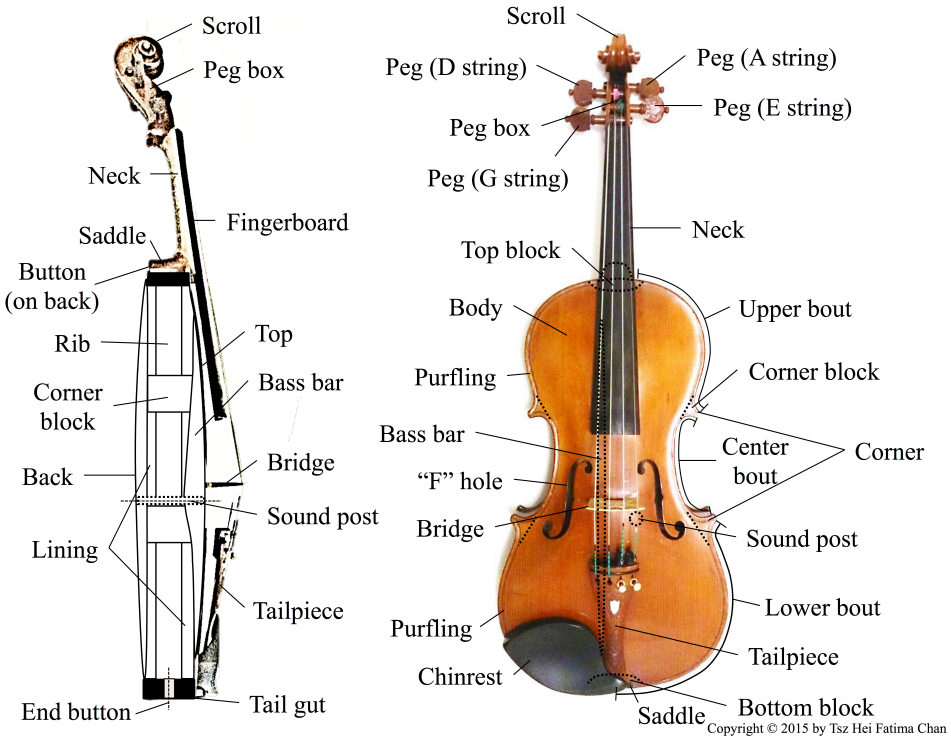


*Figure 1.* Diagram and labeled parts of the violin (original image).

In addition to the violin, the construction of the bow is another major consideration. The contemporary violin bow is comprised of an incurved wood stick and horsehair as well as the frog and screw (see Figure 2), which are used to adjust the tightness of the hair. Permarbuco (*Caesalpinia echinata*), an Amazonian wood timbre, is the premium material for an incurved bow due to its strength and resilience (Beament,

1997; Dilworth, 1992). François Xavier Tourte (1747-1835) devised the incurved bow principle and the idea that being exposed to heat bends the curve. His principle focused on the mechanism for tightening the bow as well as the degrees of curvature of the bow (Beament, 1997). The remarkable changes in the construction of the bow have expanded the potential applications of modern bowing techniques, such as *spiccato*[2] and *sautillé*[3]. After numerous explorations throughout the centuries, the length and weight of a violin bow have been somewhat standardized, ideally around 74 centimeters and 60 grams, respectively (Dilworth, 1992).

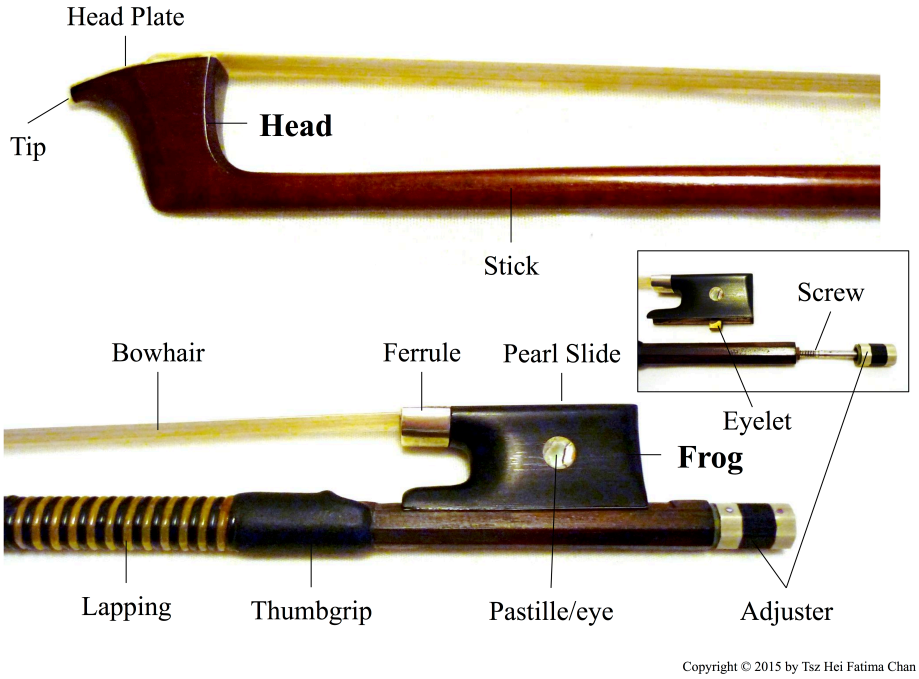


*Figure 2.* Diagram and labeled parts of the violin bow (original image).

[2] A bowing technique with a bouncing stroke played in a slow to moderate speed (Berman, Jackson, & Sarch, 1999, p. 46).
[3] Similar to *spiccato, sautillé* is a bouncing bow stroke played in a fast tempo with rapid down-up bowings, which should be played off the string (Berman, Jackson, & Sarch, 1999, p. 43).

Considering the many skillful techniques a luthier uses to create a finely-made violin, it is crucial to have a competent player who understands the structure of the instrument and the playing techniques necessary to bring the violin to life. While this is true for a musician and performer, it is of similar importance to a music therapist who would like to use the instrument during a therapeutic intervention. Therefore, acquiring the suggested playing techniques and understanding their functions provides a basic foundation for a therapist to strengthen the therapeutic clinical effects.

**The Violin Speaks and Sings**

The consideration of using string instruments, such as the violin, with live presentation in music therapy interventions has been increasing in recent years. Within the *Journal of Music Therapy* and *Music Therapy Perspectives*, a number of research articles indicated the use of the violin in clinical settings (Altshuler & Shebesta, 1941; Beer, 1990; Bonny, 1994; Bonny & Pahnke, 1972; Montello, 1999; Scheiby, 2005; Sears & Sears, 1964; Tyson, 1984). This increase may be due to the instrument's portability as well as its timbre that can potentially promote relaxation (Juslin & Laukka, 2004; Juslin & Västfjäll, 2008; Paquette, Peretz, & Belin, 2013; Paraskeva & McAdams, 1997). Despite the implementation of violin during clinical practices, the researcher knows of no research has been done relating to why and how the violin functions therapeutically. There is still more to explore within this instrument in order to determine why it may have the power to sooth and elevate the mood of an individual. Foremost, the violin speaks with vowels or vowel-like characters. Nagyvary (2013b, 2013c) in a videotaped interview stated "a violin was originally designed to sound like a female soprano voice."

This statement is supported by his most recent acoustical research (2013a), which showed that the steady-state spectra and the first two formants of the designated violin notes were closely emulated by those produced by a female operatic singer. Vowels of several European languages, such as Italian, French, German, and Russian, were evaluated. Since European luthiers made these violins, it was hypothesized that European languages could be found within their sound production. The results showed that all evaluated notes carry a distinct vowel-like character, and some were more strongly identified and easier to pronounce, while some were not. For instance, the vowels *vue* and *peu* were found in the open D and A notes; the vowel *a* as in *bad* was found in the lowest notes of G and A on the violin. Furthermore, Nagyvary (2013a) found that the vowels of *bed, bid, té, ee, vue,* and *peu* were located in the low and mid-register of those violins examined within the study.

Tai and Chung (2012) studied the relationship of formant frequencies between the Stradivari violins and females' voices. They found several pieces of evidence to support the belief that the violins can emit vowels analogous to human voices. Their study yielded several notable findings: 1) "major resonance mode of the violin corpus (0.5, 2.4, 3.5 kHz) follow a 1:5:7 ratio starting at 0.5 kHz, while male voice formants (511, 1411, 2370, 3428 Hz) follow a 1:3:5:7 ratio starting at 0.5 kHz" (p. 7); 2) "the strongest resonance modes of the violin above 400 Hz can emulate the formants of the human vocal tract" (p. 7); 3) four or five steady-state formants below 5.5 kHz were displayed in both violins and voices; 4) the frequencies of the first four formants of violins and voices displayed similarities respectively; 5) a similar range of frequencies with large formants,

especially in F1 and F2, was demonstrated in both violin notes and vowels; and 6) it was comparable to the human voice that pitch with formant 0 (F0) had no correlations with the formant frequencies of violin notes. The aforementioned results of studies by Nagyvary (2013a, 2013b, 2013c) and Tai and Chung (2012) have provided strong yet initial explanations to clarify why humans can frequently distinguish corresponding vowels while listening to the sounds played on the violin. These findings are vital to reinforcing the violin's capability to communicate and to influence positive emotions and anxiety reduction, similar to the effects of therapeutic singing.

Apart from the acoustical aspects of the violin, technical aspects such as playing techniques also play a role in expressing and manipulating moods and emotions. David Boyden et al. defined in the *Oxford Music Online* (2014):

> [The violin] is one of the most perfect instruments acoustically and has extraordinary musical versatility. In beauty and emotional appeal its tone rivals that of its model, the human voice, but at the same time the violin is capable of particular agility and brilliant figuration, making possible in one instrument the expression of moods and effects that may range, depending on the will and skill of the player, from the lyric and tender to the brilliant and dramatic. Its capacity for sustained tone is remarkable, and scarcely another instrument can produce so many nuances of expression and intensity.

This aesthetic definition delineates the beauty and emotional function of the violin, and further supports the violin as "a successful extension of the voice, [thus] a vital vehicle

for human expression" (Trueman, 1999, p. 2). With the intention of using the violin in a clinical setting, specifically as an apparatus to reduce anxiety, it is vital to recognize the variations of playing techniques of the instrument and the sound effects the instrument can emit that has an impact therapeutically. While published literature in regard to the therapeutic functions of the violin is not available, existing research articles illustrate the relationship between violin timbre, emotion changes and relieving stress (Balkwill & Thompson, 1999; Behrens & Green, 1993; Gabrielsson & Juslin, 2003; Hailstone, Omar, Henley, Frost, Kenward, & Warren, 2009; Hanser, 2010; Juslin & Laukka, 2004; Juslin & Västfjäll, 2008; Paquette, Peretz, & Belin, 2013; Pelletier, 2004; Wu, Wun, Lee, & Horner, 2013).

**Therapeutic Functions of Musical Mechanism**

Music therapy is a growing profession that matures with the movement of time. Due to its continuous growth and development, there is always a need to develop and refine the conceptual framework of individual approaches and techniques. The fundamental development of a conceptual framework can increase the treatment transparency between the music therapist and the client; thus benefitting the profession by providing stronger explanations in regard to the therapeutic functions and the corresponding effects. Music itself is a complex art form that has a strong ability to influence changes in multiple ways (Hanson-Abromeit, 2015). It is essential to decipher musical structure by articulating each musical element and its therapeutic function. Musical elements generally include timbre, tempo, rhythm, pitch, melody, harmony, dynamics, form, and style. As musical elements are an important core of music therapy

treatment, clearly understanding and intentionally implementing them may potentially enhance therapeutic outcomes (Hanson-Abromeit, 2015).

It is equally important to understand the structure and playing techniques of the applied musical instrument within the intervention. Apart from the human voice, music is generated based on the combination of sound productions that created through the musical instrument. Every subtle change within each musical element and playing technique can impact the desired therapeutic outcome, and since music is typically created with the combination of various elements, those minor changes can make an enormous impact in positive or negative directions. Therefore, analyzing each element is crucial to assist the therapist in determining the most effective direction.

Human beings often claim that listening to classical music, such as stringed instrumental music, is relaxing and pleasant, and has the potential to elevate positive emotions (Hanser, 2010; Pelletier, 2004). These positive responses are closely related to anxiety reduction, because relaxation responses and anxiety are mutually exclusive events. For instance, Lai and colleagues (2008) found that listening to classical music helped reduce nursing students' test anxiety level and promoted relaxation during the examination. Research studies also yielded results indicating that various timbres produced by different musical instruments can influence emotions and relieve stress (Juslin & Laukka, 2004; Juslin & Västfjäll, 2008). This information supports the premise of this research study, investigating the potential use of a string instrument to assist in anxiety management.

The violin is commonly described as an instrument that has the capability to mimic the human voice. Within the last decade, the relationship between violin sound and the human voice has received ample attention from acousticians. Their discovery of the science behind music allows music therapists to further apply and explain the benefits of using a violin clinically. However, the underlying theory of the use of violin to treat symptoms related to anxiety has not yet been studied. The purpose of this study was to determine the impact of the violin played with techniques specifically designed to simulate the human voice on anxiety reduction of college students prior to stressful events. The ultimate intent was to better understand the underlying theory and efficacy of using violin and make a potential future transfer to medical settings to ameliorate patient anxiety reduction.

# CHAPTER II

# REVIEW OF LITERATURE

The existence of a close relationship of the violin sound and human voice has been made apparent in scientific research studies. Since the use of human voice has been shown to be an effective therapeutic tool in anxiety reduction (Bailey & Davidson, 2002; Clift, 2012; Clift & Hancox, 2010; Jacob, Guptill, & Sumsion, 2009; Kreutz et al., 2004; Tonneijck, Kinébanian, & Josephsson, 2008; Unwin, Kenny, & Davis, 2002), the violin could be a possible substitution when using one's voice is not available. Therefore, additional literature will be reviewed to more clearly illustrate the traditional use of voice in music therapy and the varying playing techniques of the violin that can simulate human voice. In addition, supporting literature will be included to exemplify the therapeutic function of each playing technique, as well as the potential use of the violin in clinical practice to reduce anxiety. A purpose statement in regard to the impact of violin music with specific playing techniques simulating human voice on anxiety reduction of college students prior to stressful events, along with the research questions will conclude the review of literature.

## Definition of Anxiety

Anxiety is a state of alarm in response to a vague sense of threat or danger. Physiological features include an increase in respiration, perspiration, and muscle tension (Comer, 2011). The duration and intensity of anxiety fluctuates over time based on the amount of persistent and unrelenting stress an individual is experiencing (Gadberry, 2011; Lai, Liao, Huang, Chen, & Peng, 2013). Anxiety can result in many physical changes,

such as the release of epinephrine into the bloodstream, which may cause vasoconstriction, increased heart rate, blood pressure, and body temperature, as well as flushing and sweating (Bailey, 2010; Selimen & Andsoy, 2011). Other physiological symptoms that often accompany anxiety include muscle tension, dry mouth, perspiration, trembling, difficulty swallowing, dizziness, chronic fatigue, and sleeping difficulties (Cooper, 2006; Davey, 2006). Furthermore, a high anxiety level will lower immunity, which can delay wound healing and recovery.

There are many factors in everyday life that can provoke anxiety. Hospitalized patients awaiting a surgical procedure are one of the many groups of people affected. Preoperative anxiety is a common yet worldwide problem, regardless of age and the advancements in pharmacological treatments (Beccaloni, 2011). Further, it is associated with a number of adverse postoperative outcomes. Elevated blood cortisol levels, blood pressure, and heart rate are common physiological manifestations of high levels of anxiety and may lead to slower wound healing, a weakened immune response, and increased risk of infection (Bradt, Dileo, & Shim, 2013; Scott, 2004). In addition, intense anxiety can complicate the pre-surgical procedures, such as the induction of anesthesia as well as the patient's cooperation during the surgery, impact postoperative pain management, and prolong the patient's recovery (Bradt, Dileo, & Shim, 2013; Scott, 2004).

**Traditional and Alternative Treatments**

Traditionally, sedative premedication or antianxiety drugs are routinely administered to reduce patients' preoperative anxiety, which help provide the optimal

conditions for surgery. Types of pharmacological sedation that are frequently used (e.g., chloral hydrate, fentanyl, midazolam, and morphine), however, are often associated with numerous side effects, such as gastrointestinal effects, drowsiness, and respiratory depression (Agarwal, Ranjan, Dhiraaj, Lakra, Kumar, & Singh, 2005; Loewy, Hallan, Friedman, & Martinez, 2005).

Apart from pharmacological approaches, various non-pharmacological treatments such as preoperative education and cognitive-behavioral techniques are often used to ameliorate patients' anxiety. In addition, muscle relaxation is an alternative approach that is frequently used with the intention of reducing somatic activation and engendering a sense of control over one's physiological state during these treatments (Appel, 1976; Steptoe, 1989).

There are multiple methods that are used to treat anxiety, many of which have been researched to determine efficacy. Music therapy is an example of a non-pharmacological treatment for anxiety. With the growth of the music therapy profession and the efficacy demonstrated in research studies (Berlin, 1998; Bradt, Dileo, & Shim, 2013; Buffum, et al., 2006; Fagen, 1982; Ferrer, 2007; Hamel, 2001; Sendelbach, Halm, Doran, Miller, & Gaillard, 2006; Walworth, 2005), the awareness of music therapy interventions in reducing anxiety, namely patient preoperative anxiety, has increased. Singing or vocalizing is a common modality used with medical populations to help provide a landscape for self-expression, to influence mood or emotion, and to reduce anxiety due to the accessibility and efficacy of using one's voice. However, using one's voice can be overwhelming and/or intimidating for some individuals regardless of the

effectiveness of therapeutic singing in reducing anxiety that has been evidenced by research studies (Chong, 2010; Smith, 2006).

**The Human Voice and Singing**

The human voice is an integral part of every human being who is born with healthy vocal organs and the ability to hear. Using the voice allows individuals to express and communicate their thoughts, feelings, and emotions verbally and non-verbally, that is, either through speaking, singing, or vocalizing (Chong, 2010). The human voice is a seamlessly trained instrument that contains multidimensional physical and semantic features. The physical features of the human voice refer to the pitch, loudness, spectrum and formants, vibrato, and the respiration system necessary to produce sound; the semantic features refer to the vowel quality, nasality, articulation, rhythm, and speed, which are essential for demonstrating sounds with meaning, such as emotional expressions (Mores, 2009).

Whether singing or speaking, many aspects contribute to the human voice, namely physiological, psychological, and environmental factors. Regarding the physiological factor, the human voice can be affected by congenital physical structures, the physical health of the voice mechanism, and any specific pathological conditions of the individual (Dayme, 2009). A person's tone of voice may also serve as a psychological cue to the person's self-image and emotional state. This can be revealed through the breathing patterns, rhythm of utterance, pitch, speed, and articulation. For instance, the tempo of speech tends to accelerate when an individual is experiencing anxiety,

excitement, anger, or happiness, yet it may slow down during depression and excessive stress (Dayme, 2009).

Singing is a way of using the human voice as well as a means of communication. Exposure to singing often begins at an early stage of life (Austin, 2004; Chong, 2010; Loewy, 2004), such as listening to the nursery rhymes sung by an infant's mother. Across the life span, most individuals are exposed to singing within various environments. Hence, children's songs and other songs of individual significance are interwoven into the tapestry of humans' lives, remaining present until the end of life. Singing is not simply about the musical tune or the message from the lyrics, but also the significant emotional and psychological aspects that can provide therapeutic functions. Managing or reducing anxiety is only one of the many outcomes singing can impact.

**Relationship Between Singing and Anxiety**

The understanding of how the voice works has been growing due to the advancement of technology and scientific research. This has contributed to an improvement in the quality of humans' lives, both physiologically and psychologically. Active participation in the form of singing is an accessible intervention that has the capacity to benefit socialization, emotional expression, mental stimulation, and physical engagement (Clark & Harding, 2012), regardless of the ability levels of the individuals. In addition, several research studies show that active singing can increase mood ratings (Kreutz et al., 2004; Unwin, Kenny, & Davis, 2002). Singing can be an energizing and relaxing physical activity that involves pulmonary functions and promotes good posture. Moreover, it can help to relieve stress and tension (Bailey & Davidson, 2002; Jacob,

Guptill, & Sumsion, 2009; Tonneijck, Kinébanian, & Josephsson, 2008). Singing also requires a certain demand of cognitive abilities, which can function as a means of redirecting an individual away from personal worries (Clift, 2012; Clift & Hancox, 2010), thus aiding in the relief of stress and/or anxiety.

Although there are many research studies showing that using one's voice to sing is therapeutically effective and has positive effects on alleviating anxiety, the intimacy of the human voice can be overwhelming for some individuals (Chong, 2010) and that may lead to negative effects, such as further inducing anxiety. The qualitative data of Chong's (2010) research revealed that individuals are more likely to find singing to be uncomfortable especially when singing is not developed as a natural act during early childhood, as well as when the individuals are concerned about the listener's interpretation of their voice qualities. Due to these potential obstacles, research for other means that may provide similar functions to singing is needed in order to meet the individual's needs. In addition, using the voice may not be practical for all patients. For instance, a patient with tracheal intubation or a patient with lower self-esteem may experience extra stress if using their voice.

**Violin Timbres and Emotions**

Aesthetic stimuli such as music have the capability to influence strong emotional responses and changes (Grewe, Nagel, Kopiez, & Altenmüller, 2007). More specifically, the timbres of various musical instruments, including violin and voice, can contribute to a distinct effect on emotion recognition (Balkwill & Thompson, 1999; Behrens & Green, 1993; Gabrielsson & Juslin, 2003; Hailstone et al., 2009; Paquette, Peretz, & Belin, 2013).

Since the human voice is one of the primary sources for expression and communication, the higher the capability of instruments that can imitate the nature of human voice, the stronger the ability to influence emotions. Paquette, Peretz, and Belin (2013) found that the violin and vocal stimuli have a similar pattern in terms of valence and arousal ratings for different emotions when compared to clarinet stimuli. This finding supports the idea that the sound of violin has high potential to influence emotion similar to those evoked through vocal sounds.

Paraskeva and McAdams (1997) found that musical tension and relaxation can be effectively presented through various timbres, and potentially transferred to a physiological response in the listener. Wu and colleagues (2013) found that timbres of violin, trumpet and clarinet are more likely to evoke happy and joyful emotions, while horn and flute tend to suggest sad emotions. Typically, happy and joyful tones are associated with major modes within the musical structure, which is also one of the many factors that can help release tension and promote relaxation (Gabrielsson & Lindström, 2010). The violin, however, also has the ability to express sad and melancholy tones often associated with the minor mode and use of chromatic harmony (Gabrielsson & Lindström, 2010; Juslin & Västfjäll, 2008). The capability of the violin to express every subtlety of various emotions widens the possibility to meet each individual's emotional state and needs. Influencing and altering one's mood in a positive direction is the intention of using the violin in a clinical setting in order to release tension.

## The Characteristics of the Four Strings

Above all approaches a violinist can take when playing the instrument, the characteristics of the four strings are fundamental to adequately emulating voices and emotions. Every violin string carries a unique character. According to Baillot (1835/1991), the E string has a natural character of a soprano voice, which can deliver a clear and silvery timbre. The high pitches produced through the E string can present delicacy and purity in passages that contain a passionate sensation. Comparable to the E string, the A string also has the capability to sound similar to a soprano voice with a sweet and penetrating quality. The sweetness timbre becomes one of the principal attractions of the violin. An alto voice is the natural character of the D string, whose rich and warm tone quality produces a noble and silky character. Lastly, the G string, the lowest string, represents the tenor voice. Its deep and grandiose tone quality has the most energy and power to enable expression to reach the sublime. Furthermore, this string holds the foundation in supporting notes on the three higher strings.

## The Techniques of Violin Playing

Both hands are essential to achieve numerous violin techniques (Fischer, 2010; Flesch, 1939; Galamian, 1985; Jacoby, 1985). To understand the techniques expressed in this study, it is crucial to acquire basic knowledge of how these violin techniques are produced, as well as what essential skills a violinist needs to obtain in order to implement these techniques. Among the vast violin techniques of left and right hand, several are significantly capable of imitating the human voice. These include *vibrato*, *glissando*, and

*shifting* featured on the left hand; *détaché*, *legato*, *sul tasto*, and *ponticello* featured on the right hand (Baillot, 1835/1991; Eales, 1992).

**The functions of the left hand.**

The left hand performs an important role in tone formation. Galamian (1985) specified that the basic roles of the left hand are fingering the notes and generating vibrato. A simple rule to delineate natural finger placement is to "place the tip of the forefinger perpendicularly upon the proper place on the string, and draw the base of the finger as near it as possible" (Courvoisier, 2006, p. 11), also suggested by Galamian (1985). With the application of this rule, the fingers will stand firmly and cleanly on every position on the fingerboard. Thus, it is an unfailing rule for the entire technique of the left hand (Courvoisier, 2006; Galamian, 1985). Based on this fundamental skill, the additional fine technical movements of the four fingers – index, middle, ring, and little fingers – can form various tones.

Apart from finger placement, the thumb, wrist, and elbow of the left arm also play an imperative contribution to the tone quality. According to Galamian (1985), "the thumb has the function of exerting a counter-pressure [yet not rigid] against the playing fingers" (p.18), thus, the playing fingers can effectively perform the task while they are supported by the energy coming from the opposite direction. While there are exceptions for the position of the wrist, such as playing in the half position and playing chords that involve extensions, the wrist in general should be held in straight alignment with the elbow and the forearm (Galamian, 1985). Further, the position of the elbow should remain flexible while maintaining the basic placement beneath the instrument. The flexibility of the

elbow to move towards left or right is sufficient to allow the fingers to form the natural "square" position described in the basic rule when the fingers move across the strings (Galamian, 1985). Along with all the guiding principles about positioning, the most common techniques that carry the greatest potential to imitate the human voice include *vibrato*, *glissando*, and *shifting*.

*Vibrato* is a sound produced by the forward and backward movement of the finger on the same note with different degrees of speed. Animation, tenderness, and sometimes pathos are frequent expressions that can be delivered through *vibrato* (Baillot, 1835/1991). While *vibrato* can be identified into three types – performed by the arm, the hand, and the fingers – a developed *vibrato* normally involves all three types yet a particular type can be predominated (Galamian, 1985). The combination of these three types of *vibrato* is somewhat necessary because interplay of the neighboring muscles is unavoidable. Indeed, the variety of the combination can widen the range of expressiveness and tone coloring a violinist can bring out through the instrument. Moreover, *vibrato* on the violin often gives an expression similar to *vibrato* of a human voice, which can strongly affect emotion (Goydke, Altenmüller, Möller, & Münte, 2004). *Vibrato* is generally used during long sustained notes to continue the momentum of the tone similar to sustaining a tone with the voice. Capability to control the speed, width, and intensity, as well as being able to mix the various types with subtle and smooth changes are essential to bring the desired expression to its pinnacle (Galamian, 1985). Therefore, the intention to promote relaxation can become considerably more effective.

*Glissando* can be performed either ascending or descending by sliding the same finger on the fingerboard (Baillot, 1835/1991; Galamian, 1985). Sliding a note in a descending scale, also known as a descending *glissando*, is executed by moving the finger from a higher pitch to a lower pitch on the same string with adequate pressure on the fingerboard. Since there are no frets on the fingerboard of the violin, it allows the finger to move smoothly without obstacles. Hence, a seamless sound of *glissando* similar to human voice sighing can be created. This sound effect can be used to imitate an individual's emotion and energy level to validate expression. In addition, a violinist can play a *glissando* up the scale by sliding the finger towards the bridge in the opposite direction to the aforementioned. This particular sound effect can serve as an auditory stimulus for the listeners and elicit unconscious inhalation.

*Shifting* is a fingering technique of the left hand necessary for the changing of positions. The fingers of the left hand have independent roles in articulating the music. Baillot (1835/1991) stated that while "the bow sustains the sounds and sings, as does the voice; the fingers articulate as though pronouncing words, and indeed sometimes seem to speak" (p. 269). The evenness of movement of the fingers promotes a sense of steadiness and clarity (Baillot, 1835/1991; Galamian; 1985; Stowell, 1992). Shifting from one position to another on the same string allows the violinist to sustain the tone quality without changing the voice as each string carries a distinct voice. This technique can also promote continuity and stability in order to complete a passage or musical idea within the same voice. This is particularly similar to speech, allowing an individual to express fully without interruption from another individual. Furthermore, the purpose is to support the

completeness in regard to voicing when creating dialogues between characters similar to those in operatic music.

**The functions of the right hand.**

The bow is a vital component to bring music to life because it is the bow that makes the violin sound. From the moment the bow touches the string, the character of a note is revealed by the manner of its movement. Yet, the manner of ending a note is equally important and a characteristic which should not be left to chance. Bow technique generally relies on several major elements: bow speed, weight, contact point, tilt of the bow[4], and timing. Although these essential elements are few, the infinite variety of their combinations allow for the expression of music in every shade of its emotional, intellectual and artistic character (Gerle, 1991; Kjelland, 2004; Schoonderwaldt, Guettler, & Askenfelt, 2003).

Bow speed is essential in depicting the character of the bow stroke. In general, a fast attack at the beginning of a note indicates and accentuates energy and brilliance, whereas the impression of inferiority or nostalgia is often conveyed through slower bow speed at the end of a note or stroke (Gerle, 1991). In addition, one manner of demonstrating brightness, energy, and continuous power within a passage with short notes is playing off-string with full speed. Bow weight is another vital technique to make numerous violin sounds. Due to the vast desires of tonality a violinist wishes to express, proportions of the two elements can alter the relationship between the bow speed and

[4] Bows tilting away from the bridge, that is, leaning the stick towards the fingerboard, can enhance the violinist to express timbres, dynamics, and articulations with a greater variety (Kjelland, 2004; Schoonderwaldt, Guettler, & Askenfelt, 2003).

bow weight. For instance, a quiet breathy sound may entail little bow weight and bow speed. In other circumstances, the bow weight may increase while the bow speed diminishes and vice versa. The changes of either or both elements can produce a change in dynamics and timbres (Galamian, 1985; Kjelland, 2004). However, appropriate weight should be used in order to produce pleasurable tone quality, and Gerle (1991) indicates that the sound of each note should be pulled out of the instrument in lieu of being squeezed in.

The contact point of the bow is reliant on the bow speed and weight within a triangular relationship. The faster speed with less weight will require the bow to be placed closer to the fingerboard, whereas the slower speed with an increased weight will constrain the bow near to the bridge. These adjustments are essential for the production of a noble tone quality. Lastly, timing is a playing element that involves all the above techniques on both the left and right hands. The coordination of changing fingers on the left hand and changing the bow stroke with the right hand is a skill used to bring about smooth transitions between notes, phrases, and passages.

The combination of these major elements leads to the acquisition of bow division, as well as bow strokes. Bow division is "the determination of which part of the bow should be used to produce each effect or accent distinctively and in the best possible way" (Baillot, 1835/1991, p. 158). Broadly, the bow can be evenly divided into three sections: the tip, middle, and frog. Each section has a different role due to the elasticity. The tip of the bow has the least elasticity compared to the middle and frog sections, which makes it appropriate for expressing natural decay with a soft sound. The middle section is known

for its balance as it obtains the most elasticity of the wood stick and the horsehair. Baillot (1835/1991) described the middle of the bow as the center of expression that can produce full tones with sweetness due to its flexibility of weight and resistance. Lastly, the frog upholds the power of tone which usually marks the beat, accents, and strike chords.

With the various combinations of the aforementioned fundamental elements, several bow strokes can be specifically featured to emulate the human voice. These include *détaché*, *legato*, *sul tasto*, and *ponticello*. *Détaché* is the fundamental component of fast stroke (Stowell, 1992), which is used when notes are detached or not slurred (Adler, 1989; McKee, 2013), producing smooth and full tones (Baillot, 1835/1991; Fischer, 2010; Galamian, 1985; Jacoby, 1985; Kjelland, 2004; Menuhin & Primrose, 1976). *Legato* is one of the multiple forms of *détaché* in which the notes are slurred in lieu of being separated. The effect of *legato* is the same as *détaché*: sounds are created in a smooth and flowing manner. When a note is played with *legato* or *détaché* and the bow is placed on the string before a sound is emitted, it is akin to the vowel sound in voice; whereas when a note is played with off-the-string strokes, it represents the consonant sound (Eales, 1992). In other words, the soft and hard articulations in violin bow strokes are akin to consonant and vowel sounds that can be identified in the human voice (Eales, 1992; Galamian, 1985).

*Sul tasto* is defined as bowing over the fingerboard (Berman, Jackson, & Sarch, 1999; Kjelland, 2004; McKee, 2013). This technique aims to change the timbre to a warm or cooing sound based on the placement of the bow, which has an effect similar to using a rubber mute (*con sordino*) on the bridge of the violin. Menuhin and Primrose

(1976) described the sound created through *sul tasto* as delicate due to the amount of pressure the strings can bear over the fingerboard. In contrast, *ponticello* is a technique performed by placing the bow near the bridge and thus distanced from the fingerboard (Berman, Jackson, & Sarch, 1999; Kjelland, 2004). The sound created by implementing *ponticello* is a comparatively eerie sharp tone, with a nasality effect similar to the human voice.

**The role of breathing.**

Breathing is a natural physiological mechanism and is required to sustain life. While breathing is an important aspect of sustaining violin performance, it is not a primary pedagogical concern. Indeed, the knowledge of how one breathes with his bow while playing that matters. The bow serves a similar function to the natural flow of a singer's breath in multiple ways, such as "shaping a phrase through the sensitive control of its pressure" (Whone, 1972, p. 102). Moving the bow arm by drawing imaginary circles as a continuation of the bow strokes often serves as a visual aid to entrain breathing, specifically with inhalation (Whone, 1972). Baillot (1835/1991) likewise states that "returning to the frog corresponds to [visually] drawing a breath when one sings" (p. 158). Without these circles, the arm motion is incomplete and unnatural, and the bow would stop prematurely, thus affecting the sound quality and the natural flow of breath of the music, player, and listener. Furthermore, entrainment in breathing can assist an individual with relieving physical pain, a tense mind, and constrictions in the body.

Breathing and phrasing of music have a close relationship (Vickhoff, Malmgren, Aström, Nyberg, Ekström, Engwall, Snygg, Nilsson, & Jörnsten, 2013; Whone, 1972)

that can be demonstrated through diverse combinations of bowing techniques on the violin; however, rules cannot be adjusted due to various circumstances. Whone (1972) suggested that breathing must remain a natural process in order to achieve its artistic and therapeutic value. In addition, a research study conducted by Bernardi and colleagues (2001) revealed that cardiovascular and respiratory rhythms could be enhanced through consistent rhythmic stimulation implemented in the musical structure of phrasing.

**Therapeutic Functions of Violin Techniques**

Considering the violin techniques that have been illustrated, each can have a therapeutic value in music therapy when they are used intentionally. Gerle (1991) suggested that a violinist should consider several aspects when making decisions in terms of articulation and characterization of a note or a bow stroke, including whether (a) to start a note from the string or from the air; (b) an accent is desired at the beginning or not; (c) to end the note or bow stroke on or off the string; (d) to start the bow at full speed or not; and (e) the tone should remain full or taper at the end. All these elements are applicable and necessary to a music therapist when using the violin during clinical practice.

Timbres that can promote relaxation are essential to reducing the anxiety of an individual. The aforementioned violin techniques have the potential to elicit relaxation by imitating human singing quality. As for *vibrato* in singing, it generally occurs naturally based on the relaxant principle, allowing the muscles of the laryngeal mechanism to release tension (O'Connor, 2013). Additionally, O'Connor (2013) stated that *vibrato* is important for an individual to maintain equilibrium and muscular health, especially when

singing a long sustained note. Likewise, *vibrato* in violin playing has similar aspects in promoting relaxation. *Vibrato* is the cliché to relax tensed muscles (Spiering, 1908), which is applicable in both singing and playing the violin. The sound effect of *vibrato* produced through the violin can provide an auditory stimulation simulating the quality that can be emitted through human voice. Therapeutically, this auditory stimulation may arouse the individual's connotation of *vibrato* tone in the voice, thus enhancing relaxation.

Other violin techniques that have been identified with tone qualities similar to the human voice can serve as functions for validation. One can validate or empathize with an individual's vocal expression in the present moment by emulating their voice utterances. This can provide a sense of endorsement of the individual's contribution to the experience and serve as a therapeutic technique for promoting the awareness of here-and-now. Moreover, this empathic technique can also assist in establishing rapport, eliciting interaction, and conveying empathy (Bruscia, 1987; Gardstrom, 2007).

The violin bow strokes at the beginning and ending of each phrase depict the contour of phrases – *arsis* and *thesis* (Gerle, 1991). *Arsis* and *thesis* are Greek terms, originally used to describe the raising and lowering of footsteps in ancient Greek dance (Walker, 2014). Since raising and lowering is a paired motion, the terms have been associated with musical phrasing by grouping measures in pairs to promote the call and response effect within musical ideas (Abdy Williams, 1911). The contour of phrases is an important therapeutic function because it functions as a non-verbal means of communication. The *arsis* and *thesis* are comparable to the antecedent and consequence of dialogue within speaking language. In addition to the pre-existing vowel-like

characters a violin can emit, the intentional use of *arsis* and *thesis* can expand the therapeutic effectiveness in terms of entraining natural breathing, as it would while singing.

Regular rhythmic stimulation through phrasing in singing, speaking, or listening to instrumental music can entrain and regulate an individual's breathing pattern (Bernardi, Sleight, Bandinelli, Cencetti, Fattorini, Wdowczyc-Szulc, & Lagi, 2001; Gadberry, 2011; O'Connor, 2013; Vickhoff et al., 2013). When abdominal breathing is used with regular rate, muscle tension can be released; hence enhancing relaxation. In addition to entraining through the contour of musical phrases, the violin bow circular motion at the frog contains a value in providing visual cues for when an inhalation should take place (Whone, 1972). The multidimensional facets of the violin show the potential efficacy of using this instrument in clinical practice as an apparatus to promote relaxation and thus reduce anxiety.

**The Use of Violin in Music Therapy**

The violin carries a human-like sound. This special feature can be expressed through multiple playing techniques. The violin is a mechanically simple yet acoustically complex musical instrument in the Western music culture. While the physical appearance and unique acoustic features are fixed factors of each violin, the playing techniques, both on the left and right hands, become essential to the production of sound. Each hand has distinct roles in violin playing, yet both hands have to cooperate to control the rhythmical order of the tones within infinite combinations (Courvoisier, 2006; Galamian, 1985). The fingers of the left hand function as the articulators of the structure of music by pressing

against the fingerboard at fixed points and varying the length of the vibrating segments, whereas the function of the right hand is to draw the bow across the strings in order to cause them to sound. Further, the right hand controls the dynamic and timbre gradations. The violin is commonly described as the instrument capable of simulating the human voice as evidenced in research studies conducted by Tai and Chung (2012) and Nagyvary (2013a). Their findings consistently reveal that the steady-state spectra and formants produced by the violins matched those of a female singing voice. Combining the given acoustics and various playing techniques will further enhance the tone quality in regards to mimicking the human voice.

When considering the value of the violin in providing therapeutic aspects to promote relaxation and entrain breathing, it is possible for it to be used as an apparatus to reduce anxiety of individuals. The capability of simulating the human voice through the violin is crucial in establishing rapport and communication with others. Implementing the violin into clinical practice, especially in the hospital environment where singing may not be accessible or comfortable for some patients (e.g., those with tracheal intubation, lower self-esteem, or if singing was not developed as a natural act during childhood (Chong, 2013; Smith, 2006)), can open an alternate space for patients to express emotions and manage anxiety in a holistic manner without eliciting additional stress as it might during singing. Therefore, a precise understanding of violin playing techniques will permit a music therapist who uses a violin in clinical practice to make accurate decisions in terms of choosing the appropriate technical means to maximize the therapeutic effect.

No specific research has been published on the exact effect of using the violin to simulate the human voice and its influence on reducing anxiety. Therefore, this study aimed to examine the therapeutic functions of violin playing techniques on anxiety. Specifically, this study attempted to answer the following questions: (a) Does listening to violin music that simulates the human singing voice decrease anxiety levels in healthy individuals? (b) Does violin music that simulates a singer's breath have a different effect on individuals' self-reported anxiety levels than violin music that does not simulate a singer's breath?

# CHAPTER III

# METHODOLOGY

## Participants

Undergraduate ($n$ = 16) and graduate ($n$ = 24) students of various majors from a large Midwestern university were invited to participate in this study. Participants met the following criteria: a) age 18 years or older; b) no hearing problems; c) enrolled as a full-time student or with equivalent workload (i.e., teaching/research assistant); d) had at least one scheduled examination (i.e., project presentation, oral or written examination) within the next 48 hours; and e) involved in one of the following university departments or units: School of Music, Department of Special Education, Department of Psychology, or the International Student Services.

The recruitment process involved sending invitations to potential participants via e-mail (see Appendix B). In order to send out e-mail invitations to students from the specified entities, the researcher communicated with the appropriate personnel for permission. Upon receiving permission, the researcher sent the initial e-mail invitation to the staff/administrators of these entities and they forwarded the e-mail invitation to students according to their distribution lists on behalf of the researcher. The consent information, criteria for individuals to participate in the study, and a web-link leading to the online sign-up sheet were included in the invitation e-mail. Since the proposed recruitment process (i.e., sending invitations via e-mail) was not accepted by the Department of Psychology, the researcher was instead permitted to post recruitment flyers (see Appendix C) within the specified departmental areas.

In order to allow participants to sign-up for a scheduled trial, the researcher created a digital sign-up sheet by using an online program – SignUpGenius.com. The researcher pre-set the functions to ensure participants could sign-up for a time slot anonymously. Specifically, participants created first and last names of their choice while signing up by using the program. To protect participants' anonymity, these enrollment names were not shown on the list for preview by other individuals. Although participants were required to provide a valid e-mail address during the process, the researcher did not have access to this information. The purpose of the e-mail address was to allow the online program to confirm sign-up time by directly sending an e-mail to each participant. On the sign-up sheet, each time slot had a maximum of four openings to ensure each trial had no more than four participants.

Collegiate students were chosen as the sample population because they often experience high levels of anxiety due to intense study and high-pressured examination schedules (Kieffer & Reese, 2009). State anxiety could affect students' performance during examinations by interfering with their ability to efficiently encode the learned materials. This might lead to poor performance (Tobias, 1985). Anxiety could also limit students' cognitive resources, thus lowering performance ability during examination as well as state anxiety exhibited as worry and emotional symptoms when preparing for the exams (Cassady & Johnson, 2002). These indicators of stress and anxiety are similar to those found in patients with preoperative anxiety (Bailey, 2010; Buffum et al., 2006; Scott, 2004; Selimen & Andsoy, 2011), thus collegiate students were an appropriate group of individuals to be used in this study, which examines the efficacy of identified

violin playing techniques in reducing state anxiety. Furthermore, this study was conducted immediately before and during the final examination week at the end of an academic semester. The stress and anxiety a student experienced was induced naturally through their preparation and participation in scheduled final examinations.

## Human Subjects Approval and Informed Consent

This research study was approved by the Human Subjects Committee of the large Midwestern university. All participation in this research study was voluntary and was not compensated in any form. Informed consent was obtained in writing from each participant by signing an Adult Informed Consent Statement form prior to participation in the study. This consent form included a brief overview of the research protocol, explained any potential risks, and guaranteed the confidentiality of any personal information obtained from the participants (see Appendix A).

## Design

### State-Trait Anxiety Inventory for adults.

As a two-sample, pre- and posttest design, all participants completed the State-Trait Anxiety Inventory for Adults (STAI) form to indicate self-reported degree of anxiety as the dependent variable. The STAI had been widely used to measure anxiety levels in adults ages 18 and above (Maddox, 2008; Spielberger et al., 1983). It consists of two independent 20-item self-report questionnaires used to determine the symptom intensity of current anxiety (state) and the symptom frequency of pervasive anxiety (trait). For this study, participants completed only the 20-item questionnaire related to state anxiety. The means, standard deviations, and alpha reliabilities of state anxiety for

college students are indicated based on males ($M$ = 36.47, $SD$ = 10.02, $p$ = 0.91) and females ($M$ = 38.76, $SD$ = 11.95, $p$ = 0.93) (Spielberger et al., 1983).

**Experimental condition.**

The independent variable for this study was a recording of the researcher-composed selection of violin music. The experimental condition group listened to five minutes of this pre-recorded violin music with the implementation of playing techniques that were intended to mimic the human voice (i.e., *vibrato*, *glissando*, *détaché*, *legato*, *sul tasto*, *ponticello*, and right hand circular motion at the end of phrases).

**Control condition.**

The control condition group listened to the same violin composition but a different recording in which the suggested playing techniques for emulating human voice that were used in the experimental condition were not applied in this recording. This recording was played solely as instrumental music without consideration of imitating human voice. The circular motions on the right hand that symbolized singer's breathing at the end of each phrase was not applied either.

All participants were asked to complete the posttest STAI form at the conclusion of the listening task. The study began with the control condition followed by the experimental condition, with conditions alternating every time slot until all data were collected. To ensure the pre- and posttest forms completed by each participant were matched, all forms were marked with a number in sequential order prior to the beginning of the study. A set of forms – consent form, demographic questionnaire, pre- and posttest

STAI forms – with matched number that were marked on the top corners were attached to a clipboard and was given to each participant at the beginning of the study.

**Music Composition**

The researcher composed five minutes of violin music (see Appendix E). Five minutes was chosen as the length for the music in this study mainly due to the ethical concerns of the total time needed to complete the participation process. The composition incorporated musical elements and structures that had been found to be relaxing and soothing according to the existing literature and previous research findings (Balkwill & Thompson, 1999; Crowder, 1984; Gabrielsson & Lindström, 2010; Gagnon & Peretz, 2003; Gundlach, 1935; Hevner, 1937; Imberty, 1979; MacDorman, Ough, & Ho, 2007; Nielsen, 1983; Rigg, 1939; Scherer & Oshinsky, 1977; Thompson & Robitaille, 1992; Watson, 1942). Musical elements designated in the literature as capable of inducing relaxation were vital components of the original music composition used in this study. The musical elements purposefully manipulated included tempo, pitch, melodic contour, musical form, mode, harmonic progression, and pause/rest.

Tempo is one representation of energy, dynamism, and motivation, which has a strong association with the listeners' perception of the given music. Both fast and slow tempi can elicit positive or negative valence (Gabrielsson & Lindström, 2010). For the purpose of producing a relaxed atmosphere, a slower tempo is recommended. Rigg (1940b) studied the emotional responses associated with different tempi, from 60 to 160 beats per minute with one beat equal to a quarter note. He found that slower tempi are consistently associated with sadness and melancholy, whereas faster tempi typically

generate joyful, energetic, and happy emotions. Other research findings suggest slow tempi can produce a sense of tranquility, dreaminess, sentimentality, and peace (Balkwill & Thompson, 1999; Gundlach, 1935; Hevner, 1937). These indicated feelings are conducive to evoking relaxation. The tempo in this composition was set at 60 beats per minute at the beginning of the music a half note as the beat. The tempo gradually slowed down to 40 beats per minute by the end of the composition.

Pitches were arranged in particular sequences to form melodies of varying lengths and contours. High pitches are generally associated with sentiments like happiness, pleasantness, purity, dreaminess, and peace, yet they also have the ability to evoke surprise, anger, and fear (Gabrielsson & Lindström, 2010; Gundlach, 1935; Hevner, 1937; Scherer & Oshinsky, 1977). Low pitches can generate sounds of sadness, melancholy, vigor, serenity, dignity, agitation and seriousness (Gabrielsson & Lindström, 2010; Gundlach, 1935; Hevner, 1937; Rigg, 1940a; Watson, 1942). High and low pitches have diverse yet significant value in promoting relaxation according to the emotional effects found in research. Various pitch levels were incorporated into the musical composition in order to maximize the potential of music to induce relaxation. However, pitch intervals such as an unresolved harmonic progression and tritone – a musical interval that is formed with three adjacent whole tones – was prevented in this composition.

Melodic contour and phrasing can be used to manipulate emotional changes (Thompson & Robitaille, 1992), and are considered important components in vocal music. Therefore, the arrangement of melodic contour and phrasing in this original composition were similar to vocal music in order to increase the similarity to singing while played on

the violin. According to Gundlach (1935), a narrow melodic range is more likely to yield a sentimental, tranquil, delicate, and triumphant environment. In addition to applying a narrow melodic range to the original composition, the melodic motion included musical notes that were in stepwise motion, as well as with intervallic leaps. The combination of the two types of melodic motions has a tendency to promote peacefulness (Thompson & Robitaille, 1992), which is associated with relaxation.

Various research findings suggest that musical form with low complexity can produce expressions of relaxation, less tension, joy, peace, and positive emotions (Balkwill & Thompson, 1999; Gabrielsson & Lindström, 2010; Imberty, 1979; Nielsen, 1983). The music composed for this study was structured in ternary form, also known as ABA form. The A section of the music was in a major key while B section was in the relative minor key of the A section. Changes of keys from major to minor were used to promote neural stimulation (Suzuki, Okamura, Kawachi, Tashiro, Arao, Hoshishiba, Gyoba, & Yanai, 2008), yet stay closely related so that the listeners are not overstimulated unexpectedly. According to the research studies conducted by Crowder (1984), Gagnon and Peretz (2003) and Hevner (1935), both major and minor keys can evoke considerable aesthetic pleasure regardless of their diverse affective qualities. Suzuki and colleagues (2008) also found that consonant chords in both major and minor keys could strongly activate the dorsomedial midbrain regions. In addition, major and minor consonant chords activate various distinct spatial regions that are associated with reward systems and emotions with stronger effects being shown by the major chords (Suzuki et al., 2008). Returning to the home key in the conclusion section of the piece

with the same musical material from the beginning would provide a sense of predictability and structure.

Simple and consonant chords were also considered when designing harmonic progressions and cadences within this original music composition. Research studies suggest that harmony that is simple and consonant can produce positive emotional expressions including happiness, joy, gracefulness, serenity, and dreaminess (Gabrielsson & Lindström, 2010; Hevner, 1935; Rigg, 1939; Watson, 1942). Furthermore, a pause or rest beat was only applied after a tonal closure because the listeners would perceive less tension from the music in this manner (MacDorman, Ough, & Ho, 2007).

As articulated above, evidence-based research confirmed that designated musical elements have unique therapeutic effects on inducing relaxation and evoking positive emotion expressions (Balkwill & Thompson, 1999; Crowder, 1984; Gabrielsson & Lindström, 2010; Gagnon & Peretz, 2003; Gundlach, 1935; Hevner, 1937; Imberty, 1979; MacDorman, Ough, & Ho, 2007; Nielsen, 1983; Rigg, 1939; Scherer & Oshinsky, 1977; Thompson & Robitaille, 1992; Watson, 1942). Therefore, explicit design of musical elements in the composition of this study should be considered. For instance, the tempo should be slow to produce a sense of tranquility (Balkwill & Thompson, 1999; Gundlach, 1935; Hevner, 1937). High and low pitches should be included as they both have value in promoting relaxation (Gabrielsson & Lindström, 2010; Gundlach, 1935; Hevner, 1937; Rigg, 1940a; Scherer & Oshinsky, 1977; Watson, 1942). The melodic contour should be structured within a narrow range, yet stepwise motion and intervallic leaps should be included as these features have the tendency to promote tranquility and peacefulness as

associated with relaxation (Gundlach, 1935; Thompson & Robitaille, 1992). Furthermore, simple structure of musical form (i.e., ternary) with tonality changed within major and relative minor keys should be considered due to their values in promoting neural stimulation, a sense of predictability, and aesthetic pleasure, which are all essential qualities associated with relaxation (Balkwill & Thompson, 1999; Crowder, 1984; Gabrielsson & Lindström, 2010; Gagnon & Peretz, 2003; Hevner, 1935; Imberty, 1979; Nielsen, 1983; Suzuki et al., 2008).

The purpose of using original music was to avoid a potential third variable, such as positive or negative emotions from past memories that might be associated with familiar or pre-composed music, thus distorting the research outcomes. With original music composition the researcher could implement musical elements that, according to previous literature, promote therapeutic effects in terms of relaxation, and prevent using musical elements that might yield adverse outcomes like tension or anxiety.

**The violin used in the study.**

The violin that was used for this research study was made in Prague, Czech Republic, in 1952. The body of the violin was finely made with maple wood, and the height of the front and back pieces were lowered similarly to the design suggested by Antonio Stradivari (Dilworth, 2002), mentioned previously. The incurved violin bow was made of Pernambuco wood from Brazil, which maintained strength and resilience in producing quality sound through the violin.

Evah Pirazzi synthetic strings were used on the violin, which consisted of a goldsteel E string, aluminum A string, and silver D and G strings. The core of these

strings was made of a modern synthetic multifilament fiber. Pirastro (n.d.) suggested that this set of strings could produce an intensive, powerful, and expressive sound with exceptional responses and nuances at all dynamic levels. These specific strings were chosen based on the resilience and the sound reaction of the violin itself, which was verified by three professional violinists excluding the researcher.

**Recordings of the study.**

The recordings of violin music for experimental and control condition of this study were played and recorded by the researcher in a closed area with an elevated wooden ceiling and tile flooring. The acoustic of this area allowed the sound to transmit freely, yet also created reverberation of sound due to the large space and delayed reflection. A Zoom model H4n Handy Digital Recorder was used to record the musical material. This device has the inbuilt X/Y stereo condenser microphones designed to receive the sound source with equal distance.

As a board certified music therapist, a professional diploma and degree holder in violin performance, the researcher possessed the qualifications to compose and perform the recorded model in this research. The composition relied on the researcher's education in music theory, counterpoint composition, and music therapy foundations, as well as existing literature related to the topic. The quality of musical performance in the stimulus recordings relied on the researcher's 22 years of professional training and experience in violin and choral performances. The experience of intensive choral training allowed the researcher to obtain deep understanding of voice production, which was one of the features in terms of phrasing and breathing in this study. In order to ensure the validity of

the recordings of violin music for this study, both recordings for the experimental and control conditions were evaluated by an experienced violinist and pedagogue and a principal choral conductor of an internationally recognized choral organization. Both experts identified there were differences between the two recordings for the experimental and control conditions. The violinist/pedagogue stated one of the recordings applied violin playing techniques (i.e., *vibrato*, *glissando*, *shifting*), while the other recording did not play with these specific playing techniques. This evaluator also indicated that the structure of the composition sounded similar to choral music. The choral conductor described the differences as one recording was played with expression and momentum (experimental condition) while the other recording was played without these qualities (control condition). In addition, the choral conductor considered that the composition carried the values of vocal music in terms of melodic contour and pitch range.

**Setting**

The study was conducted in the School of Music of a large Midwestern university. Each trial of the experimental and control conditions included a maximum of four participants depending upon the independent sign-ups of the participants. The room was quiet with dimmed lighting to suggest a relaxed atmosphere. Chairs were arranged in a semi-circle with space to ensure participants could maintain physical comfort and independence. A pencil and a clipboard were provided to each participant for completing the demographic questionnaire, and the pre- and posttest State Trait Anxiety Inventory (STAI) forms. To ensure all participants understood the participation process thoroughly,

the researcher prepared a script that provided detailed instructions, which was presented to the participants verbally at the beginning of the study.

*Script used during the research study:*

*(Participants arrived to the research room and were seated in the chairs that were preset in the room.)*

*Researcher: Thank you for your interest in participating in this research study.*

*(Researcher passed out pencils and clipboards with the research materials attached to participants.)*

*Researcher: In this packet, you will find the consent form on the top pages, followed by the demographic questionnaire, and STAI forms for pre- and posttest measures. The purpose of this research study is to determine whether violin music that played with techniques specifically designed to simulate the human voice has an impact on anxiety reduction in college students prior to stressful events. Your participation is completely voluntary and confidential. There is no foreseen harm physically, mentally, or psychologically in participating this research study. You may withdraw from the study at any time during your participation. During your participation, you will fill out a demographic questionnaire, and the pretest STAI form. Then, you will listen to five minutes of recorded violin music. After the listening task, you will then fill out the posttest STAI form. Please take your time to read the consent form, and sign on the third page*

*if you do not have any questions and would like to consent to participate in this study. If you have any questions, you may ask me at any time before you sign the consent form and/or during your participation.*

*(Participants read and signed the consent form.)*

*Researcher: Before we begin, I am going to test the volume, and please let me know if the sound projected from the computer is clear to hear.*

*(Researcher played an audio test to check the volume. Participants responded that the volume was audible.)*

*Researcher: Now, you may fill out the demographic questionnaire and the pretest STAI form that are in your packet.*

*(Participants filled out the demographic questionnaire and pretest STAI form.)*

*Researcher: Now, I will play the recorded music of the study.*

*(Listening task.)*

*(After the listening task was completed, participants filled out the posttest STAI form.)*

*Researcher: Thank you very much for your time and participation in the study.*

**Procedures**

Participants were invited to sit in a chair throughout their participation in the study. Participants were given sufficient time to read the consent form and ask the researcher to clarify questions. Participants who met the inclusion criteria as indicated in

the invitation e-mail and had provided written consent completed a general demographic questionnaire. This questionnaire obtained participants' age, sex, enrollment status, and degree major (see Appendix D). Upon completion of the demographic questionnaire, participants filled out the pre-test STAI form. Participants then listened to five minutes of researcher-composed violin music of either the experimental or control condition, depending upon the treatment assignment. The researcher played the recording through a Lenovo laptop computer (model B470) at a preset volume that all participants were able to hear. In order to ensure all participants were able to hear the recording, the researcher played an audio test and asked the participants whether the sound was clear to hear. The music that was presented was of the same composition, but with different experimental emphasis in each of the two conditions. The experimental group listened to a version that consists of playing techniques that were intended to simulate the human voice, while the control group listened to a different recording of the same composition in which those specified techniques were not applied. When the music ended, the researcher asked each participant to complete the posttest STAI form (see Figure 3).

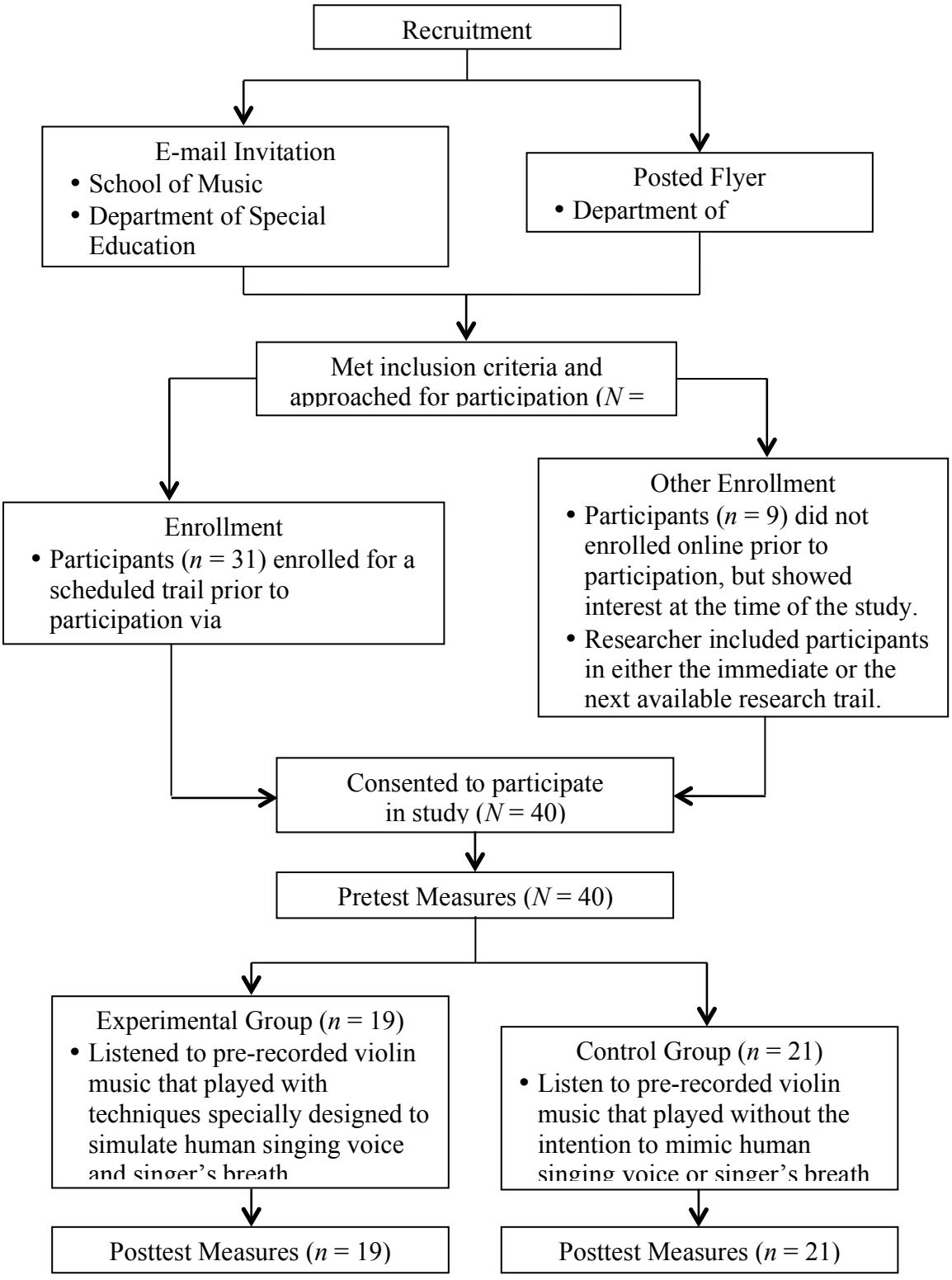


*Figure 3.* Consort flow diagram for research trail accrual, delivery, and data collection.

**Data Analysis**

Descriptive statistics were used to describe the sample and the state anxiety scores that were collected through the STAI forms. A one-way repeated-measures Analysis of Variance (ANOVA) was computed to analyze the between-participants factor, namely the experimental and control groups. The within-participants factor included time of measurement effect. Statistical significance was set at an alpha level of 0.05. All statistical analyses were performed using SPSS statistical package software, version 22.0 (The IBM SPSS Inc.).

# CHAPTER IV

# RESULTS

## Demographics

Forty participants ($N = 40$), six males and thirty-four females, between the ages of eighteen and forty-two ($M = 24.11$, $SD = 4.48$), volunteered to participate in the research study. Participants included undergraduate students ($n = 16$, 40%) with a mean age of 20.84 ($SD = 2.06$), and graduate students ($n = 24$, 60%) with a mean age of 26.29 ($SD = 4.34$). Participants were assigned to either the experimental ($n = 19$) or control group ($n = 21$) based on the predetermined research schedule and the time slot participants signed up for through the online system. Group assignments remained unknown to the participants. Both groups, experimental ($M = 24.05$, $SD = 3.15$) and control ($M = 24.17$, $SD = 5.49$), had a similar mean of age. There were seven undergraduate and twelve graduate students in the experimental group, while there were nine undergraduate and eleven graduate students who comprised the control group.

Due to the research room's close proximity to academic classrooms, there were a number of participants who did not originally enroll to participate in the research study, but had received an e-mail invitation, showed interest at the time of the study, and met the research inclusion criterion. The researcher included this group of participants ($n = 9$) in either the immediate or the next available research time slot. The study's location resulted in the majority of participants being from the School of Music (95%) with the remaining 5 percent of participants coming from other academic disciplines.

Prior to their participation in the study, all participants read and signed the adult informed consent form and then completed the demographic questionnaire as part of the study. According to the written responses, all participants indicated that they had at least one or more scheduled oral (47.5%) or written examination (55%), or project presentation (50%) within the 48 hours following their participation in the study. In addition, the percentages of participants that indicated they had one, two, or all three types of examinations and project presentations were 27.5%, 15%, and 5% (experimental), and 27.5%, 22.5%, and 2.5% (control), respectively.

**Quantitative Data**

A one-way repeated-measures analysis of variance (ANOVA) was computed to evaluate the effect of violin music on anxiety scorings of college students during times of stressful preparation for presentations or examinations. The dependent variable was the STAI self-report anxiety score, ranging from 20 (low anxiety) to 80 (very high anxiety). The between-participants factor was violin music which included two levels: violin music with playing techniques that were intended to mimic the human voice, and violin music without consideration of imitating the human voice. The within-participants factor was time (pre- and posttest).

Anxiety scores on the pretest were similar between the experimental group ($M$ = 46.79, $SD$ = 13.11) and the control group ($M$ = 44.14, $SD$ = 10.78) as shown in Figure 4. Anxiety scores on the posttest were also similar between the experimental group ($M$ = 32.16, $SD$ = 9.05) and the control group ($M$ = 34.10, $SD$ = 9.74) as shown in Figure 5.

Levene's Test indicated that the model met the assumption of homogeneity of variance, $F$ (1, 38) = 1.49, $p$ = 0.23 (pretest) and $F$ (1, 38) = 0.44, $p$ = 0.51 (posttest).

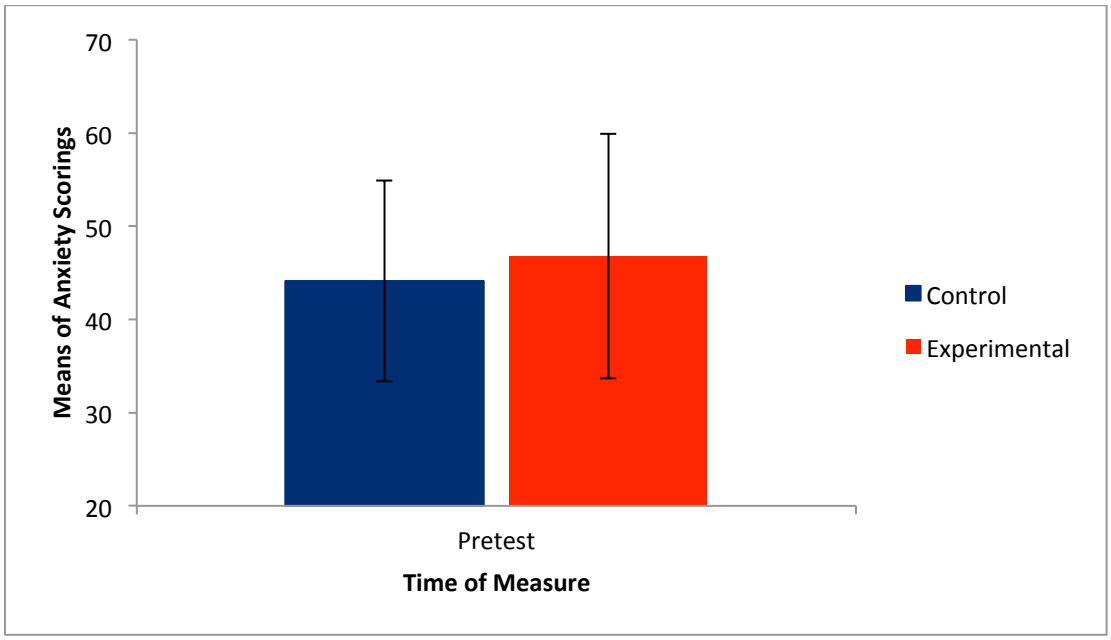


*Figure 4.* Comparisons of experimental and control group anxiety scores at pretest.

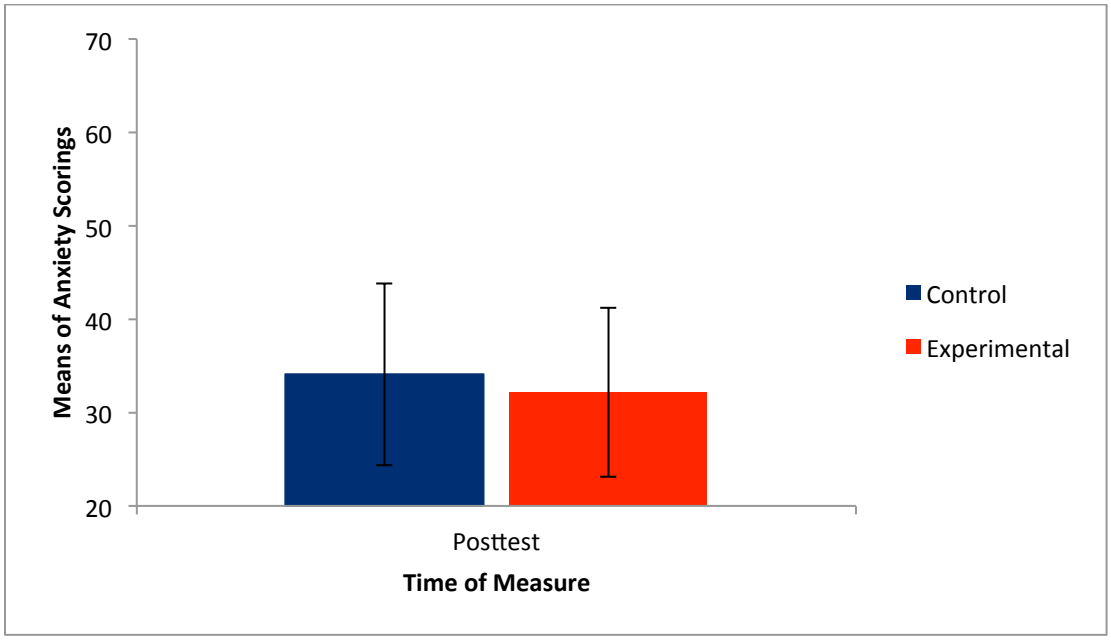


*Figure 5.* Comparisons of experimental and control group anxiety scores at posttest.

Results indicated a statistically significant main effect for Time, $\Lambda = 0.38$, $F$ (1, 38) = 63.05, $p = 0.00$, $\eta^2 = 0.62$. That is, state anxiety scores of participants were decreased from pre- to posttest as shown in both experimental and control groups. The main effect for 'Group' and the interaction effect were not significant (see Figure 6). See Table 1 for the results of the one-way repeated-measures ANOVA for anxiety (STAI) scores.

Table 1

*One-way Repeated-Measures ANOVA for STAI Scores*

| Effect | *N* | *F* | *df* | $\Lambda$ | *SS* | $\eta^2$ | *P* |
|---|---|---|---|---|---|---|---|
| Group | 40 | 0.01 | 1 | | 2.51 | 0.00 | 0.91 |
| Time | 40 | 63.05 | 1 | 0.38 | | 0.62 | 0.00 |
| Time x Group | 40 | 2.18 | 1 | 0.95 | | 0.05 | 0.15 |
| Intercept | 40 | 673.05 | 1 | | 123227.51 | 0.95 | 0.00 |

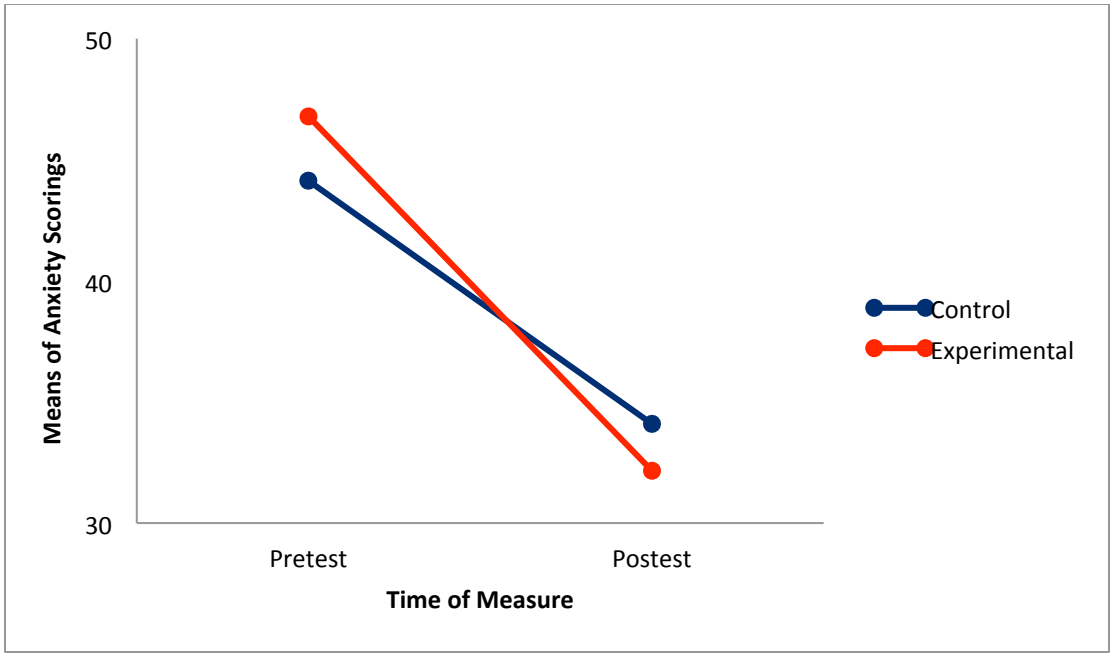


*Figure 6.* Profile plot of anxiety scores from pre- to posttest of the experimental and control groups.

# CHAPTER V

# DISCUSSION

The purpose of this study was to determine the impact of the violin played with techniques specifically designed to simulate the human voice on anxiety reduction of college students prior to stressful events. The researcher explored whether listening to violin music with playing techniques that simulates the human singing voice and a singer's breath would yield different outcomes on healthy individuals' degree of state anxiety. Quantitative assessment was used to identify differences between the effects of violin music played with techniques specifically designed to simulate the human voice and violin music played without consideration of human voice simulation.

## Statistical Interpretation

Statistical changes associated with the between-participants 'Group' main effect were not statistically significant. No one method emerged as more effective than the other condition based on the statistical results yielded for the between groups effect. However, the statistical outcomes of this study revealed that both conditions, violin music with or without the playing techniques explicitly designed to mimic the human voice, were significantly effective in reducing degree of anxiety from pre- to posttest within each group.

Despite the fact that statistical effect size of these findings was minimal, the reduction in STAI scores for state anxiety in both the experimental and control groups was substantial. The reduction of anxiety levels found in this study aligned with the concept illustrated in existing studies (Hanser, 2010; Juslin & Laukka, 2004; Juslin &

Västfjäll, 2008; Paquette, Peretz, & Belin, 2013; Pelletier, 2004) that emotional changes could evolve by listening to specific timbres. Precisely, the violin music presented in this study manipulated the participants towards positive responses in regard to anxiety reduction. This positive result asserted that Boyden et al. (2014) and Trueman (1999) may have been correct with the premise regarding the emotional functions of the violin.

Participants who listened to violin music with playing techniques that simulated the human singing voice reported marginally lower STAI scores than those who were exposed to violin music that was played without the intention of mimicking the human singing voice. However, the marginal difference between the two groups were not substantial enough to propose that the intentional use of playing techniques that are analogous to the singing voice may have played a role in the additional reduction of state anxiety in the experimental group. Yet, theoretically the auditory stimulation produced through the *vibrato* on the violin may have aroused the participants' connotation of *vibrato* tone in the singing voice. Since *vibrato* in the singing voice can promote relaxation (O'Connor, 2013), the particular association suggested through the violin sound may have the potential to similar relaxation responses thus decreasing the degree of anxiety. The *glissando* used in the violin music for the experimental group was deliberately designed to simulate vocal sighing in human voice, which is a natural yet subtle reaction during exhalation. Through these playing techniques, as well as the phrasing of the music, the regularity of participants' respiration may have possibly been entrained. Moreover, in the recording of violin music for the experimental group, the researcher also incorporated right hand circular motions to emphasize breathing at the

end of each phrase, likewise in singing. This implication may have caused the participants to subconsciously breathe in time with the musical phrases, as demonstrated in previous research (Bernardi et al., 2001; Gadberry, 2011; O'Connor, 2013; Vickhoff et al., 2013). For these reasons, relaxation responses may have been promoted and that reflected in the reduced anxiety scores.

A notable consideration was the existence of a small number of outliers found within the pretest STAI scores. These scores were very close to the minimum possible scores of the STAI scoring range (i.e., 25 on the range of 20 (low anxiety) to 80 (very high anxiety)), which may have altered the statistical results of the study. For example, the extreme low scores could impact the possibility of a decrease from pre- to posttest due to this low score at the outset that indicates very low anxiety of the individual even before treatment. Likewise, if an individual was experiencing an extremely high level of anxiety and was not able to manage the symptoms, the possibility of a decrease from pre- to posttest could also be minimal. Otherwise, a very high anxiety score (i.e., 72) would typically have a wider range to decrease from pre- to posttest, which may potentially have impacted the overall statistical results towards significance direction.

In addition, informal information collected by the researcher was that all participants, excluding two, expressed calmness and relaxation during the listening task of the study, as well as the physical sensation of anxiety reduction after their participation. The two participants, however, indicated that they felt even more anxious after listening to the violin music of the study. One specified that she began thinking about the examination materials during the listening process. Interestingly, the researcher also

noted in the posttest STAI scores, there were two participants who reported increased anxiety as compared to their pretest anxiety scores.

As mentioned previously, music is generated through the combination of multiple interrelated components, and eliminating any of them would produce varying effects in participants' responses in this research study. This factor increased the difficulties for the researcher to affirm that the changes in anxiety levels were solely based on one or multiple elements. However, the effect of using violin to reduce state anxiety was notable. This notable outcome may enhance the potential of using the violin clinically such as in the medical setting to ameliorate patient preoperative anxiety. When using one's voice to sing may not be available or comfortable for some patients due to their health condition and/or level of self-esteem, the violin may possibly function as an initial apparatus reaching out to the individuals and meeting their needs specifically and effectively.

Furthermore, the promising findings of this study support the concept that deliberate use of musical elements (i.e., tempo, pitch, melodic contour, musical form, mode, harmonic progression, and pause/rest) with explicit explanation and organization is crucial in music therapy. It is known in existing research studies that every musical element carries a distinct role (Balkwill & Thompson, 1999; Crowder, 1984; Gabrielsson & Lindström, 2010; Gagnon & Peretz, 2003; Gundlach, 1935; Hevner, 1937; Imberty, 1979; MacDorman, Ough, & Ho, 2007; Nielsen, 1983; Rigg, 1939; Thompson & Robitaille, 1992; Watson, 1942). The researcher analyzed the characteristics and potential functions of each musical element that associates with relaxation and carefully designed these elements in the original composition that was used in this research study. The

results yielded for main effect of time seem to reflect the therapeutic efficacy of the musical elements through the STAI scores collected from pre- to posttest.

**Limitations of the Current Study**

Several factors could have contributed to the lack of statistically significant results within this study. The sample size of the present study was small, only forty participants. Based on the design of the study, a minimum of sixty participants would be recommended. Additionally, the majority of participants were coming from the same academic discipline, the School of Music, due to the close proximity of the research room to the academic classrooms. However, this unbalanced representation of academic disciplines amongst the participants should not be a major hindrance to the research outcomes regarding the perception of music. As indicated in preceding studies (Fredrickson, 2000; Madsen & Fredrickson, 1993; Nielsen, 1983), highly trained musicians and non-musicians do not demonstrate diverse responses to music, including affective response and analytical ability. However, the timbre of the violin may have influenced the participants' receptions differently. The timbre of a musical instrument is a personal attribute that varies from individual to individual. In particular, if a participant has a negative or unpleasant past experience associated with a specific timbre, violin sound in this case, the possibility to alter the participant's response in a positive direction may be limited.

Measuring anxiety as a dependent variable in experimental studies can be difficult due to the challenges of inducing and controlling participants' degree of anxiety. Every individual is unique and each person's experience and coping with anxiety is personal,

and often different. Intense study and pressured examination schedules often lead college students to experience high levels of anxiety (Cassady & Johnson, 2002; Kieffer & Reese, 2009; Tobias, 1985). In lieu of inducing additional anxiety in the participants due to ethical concerns, the researcher scheduled the study during a time of and anxiety-prone environment naturally created by final examinations. Although a level of anxiety was assumed, the varying types and numbers of examinations each participant had within the 48 hours timeframe might have affected their specific degree of anxiety.

Finally, self-deception and memory should be considered as possible limitations of self-reported data (Paulhus & Vazire, 2007). While participants likely did their best to respond directly and insightfully, the total time each participant took to complete the STAI forms varied. Further, some participants might remember their original responses during the pretest, and these memories could have influenced their responses when completing the posttest STAI form.

**Future Research Recommendations**

This present research study was intended to be a starting point for music therapists to explore the potential use of violin, and its therapeutic functions in simulating human singing voice, to enhance anxiety reduction. Although statistical analysis did not illustrate any significant differences between the impacts of the experimental and control conditions, the reduction of STAI state anxiety scores in ninety-five percent of participants indicates an overall positive response to violin music, regardless of the treatment conditions. The positive responses from participants allow the researcher to assert that violin music does have an impact on enhancing anxiety reduction.

Since the number of participants in this study was limited, increasing the sample size is suggested. A larger sample size may increase the statistical power and effect size of the study, potentially altering the statistical outcome. In addition to self-report of anxiety, recording overt behaviors and physiological responses may be beneficial to fully evaluate the relaxation responses of participants. This is because anxiety is typically associates with multiple physiological symptoms (Cooper, 2006; Davey, 2006). Qualitative assessment in regard to participants' preferences of music timbres and instruments during the enrollment phase of a study may better control the similarity of participants, therefore narrowing the variability among individuals. This qualitative assessment will help determine whether changes in anxiety scores are influenced by the relaxation response that violin music elicits in lieu of other factors such as personal experience associated with the suggested timbre. Furthermore, replications of this study with matching groups, according to trait anxiety measures, as well as implementing the violin music in live presentation would be beneficial. Measuring trait anxiety of individuals may allow the researcher to determine how much of the changes in anxiety levels are influenced by the violin music and not the personality of the individuals.

Another beneficial replication of this study would be including professional singers singing the exact same composed music as used in this study on a neutral syllable with and without singing characteristics (i.e., *vibrato* and *glissando*). Therefore, the researcher may compare the efficacy and differences between using a human singing voice and violin techniques on anxiety reduction based on the same music composition. Additionally, a follow-up survey in regard to participants' thoughts about the musical

elements and what they felt potentially soothing would provide useful information to evaluate the effectiveness of the original composed music in promoting relaxation, thus reducing stress/anxiety.

The violin itself has the ability to produce a vowel-like character comparable to human singing voice (Tai & Chung, 2012; Nagyvary, 2013a). Researchers might want to consider investigating the relationship between violins of different qualities and the changes in anxiety levels of individuals prior to stressful events. This will encourage many professionals, including the acousticians, professional violinists, music therapists, as well as luthiers, to obtain a deeper understanding of the pinnacle potentials of the violin in promoting relaxation and a pleasing sound quality.

Music therapy is one of the non-pharmacological treatments that can assist an individual with managing and/or alleviating anxiety. While no one musical selection can be effective for all individuals in all circumstances (Farnsworth, 1969), exploring innovative interventions to enhance anxiety reduction is a perpetual need in the field of music therapy. Although this particular study did not yield significant results statistically in regard to the simulation of human singing voice through violin playing techniques, the ability of violin music and structured musical elements to effectively reduce anxiety is undeniable. The better we understand the therapeutic potential and benefits of this fascinating instrument, the more convincing it will be for music therapists to use the violin clinically. Therefore, further research study into this topic area is warranted and encouraged.

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# APPENDICES

# APPENDIX A

# ADULT INFORMED CONSENT STATEMENT

**ADULT INFORMED CONSENT STATEMENT**

**The Concept Behind Using Violin Clinically: The Impact of Violin Playing Techniques Specifically Designed to Simulate the Human Voice on Reducing Anxiety.**

**INTRODUCTION**

The Division of Music Education and Music Therapy at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

**PURPOSE OF THE STUDY**

The purpose of this study will be to determine the impact of the violin played with techniques specifically designed to simulate the human voice on anxiety reduction of college students during stressful events.

**PROCEDURES**

You will be asked to complete a researcher-designed demographic questionnaire, a pre- and posttest State-Trait Anxiety Inventory for Adults (STAI) forms. The questionnaire will include information on age, sex, enrollment status, degree major, and the upcoming scheduled examination and presentations; and the STAI form is an assessment tool contains 20 short statements to which you will respond to what extent you agree as either very much so, moderately so, somewhat, or not at all.

After completing the demographic questionnaire and pre-test STAI form, you will listen to five-minute pre-recorded violin music. After the listening task, you will be asked to complete the posttest State-Trait Anxiety Inventory for Adults (STAI) form. The study will take approximately 15 to 20 minutes.

**RISKS**

There are no foreseen health or physical risks resulting from participation in this study.

**BENEFITS**

Although participation may not benefit you directly, we believe that the information obtained from this study will help us gain a better understanding of how the violin and its playing techniques can be used to help individuals develop coping skills related to stress and anxiety. Participation in this study could result in decreased level of anxiety.

**PAYMENT TO PARTICIPANTS**

Participants will not be paid for their involvement in this study.

**PARTICIPANT CONFIDENTIALITY**

Your name will not be associated in any way with the research findings from this study. The researchers will use a study number instead of your name, so information will be kept anonymous. The researchers will not share information about you unless required by law or unless you give written permission.

**REFUSAL TO SIGN CONSENT AND AUTHORIZATION**

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

**CANCELLING THIS CONSENT AND AUTHORIZATION**

You may withdraw your consent to participate in this study at any time. You also have the right to cancel the permission to use and disclose further information collected about you, in writing, by sending your written request to: Tsz Hei Fatima Chan, MT-BC 1530 Naismith Drive, Murphy Hall, University of Kansas, Lawrence, KS 66045.

If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

**QUESTIONS ABOUT PARTICIPATION**

Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

**PARTICIPANT CERTIFICATION:**

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385, write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____

Type/Print Participant's Name Date

_____

Participant's Signature

Researcher Contact Information


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## APPENDIX B

## RESEARCH STUDY INVITATION LETTER

**The University of Kansas**

**Division of Music Education and Music Therapy**

Principal Investigator: Tsz Hei Fatima Chan, B.M., MT-BC

Faculty Supervisor: Cynthia Colwell, Ph.D, MT-BC

Dear Undergraduate and Graduate Students:

My name is Tsz Hei Fatima Chan and I am a graduate student in the Division of Music Education and Music Therapy at the University of Kansas. I am conducting a study to determine the impact of the violin played with techniques specifically designed to simulate the human voice on anxiety reduction of college students during stressful events. The study will take approximately 15 to 20 minutes. The content of the questionnaires should cause no more discomfort than you would experience in your everyday life.

In order to be qualified to participate, you will need to meet the following criteria: a) age 18 years or older; b) no hearing problems; c) enrolled as full-time student or with equivalent workload (i.e. teaching/research assistant); d) have at least one scheduled oral or written examination or project presentation within the next 48 hours; and e) involve in one of the following entities: School of Music, Department of Special Education, Department of Psychology, or the International Student Services. If you are meeting all the above inclusion criteria, you are invited to participate in this research study. To participate in this study, please access the digital sign-up sheet via the link below and sign-up for a time slot that is convenient to your schedule and fits the criterion of 48 hours prior to a scheduled examination or presentation. Signing up for the study and your participation in the study will be voluntary and anonymous.

On the day of your participation, you will be asked to complete a researcher-designed demographic questionnaire, a pre- and posttest State-Trait Anxiety Inventory for Adults (STAI) forms. The questionnaire will include information on age, sex, enrollment status, degree major, and the upcoming scheduled examination or presentation; and the STAI form is an assessment tool contains 20 short statements to which you will respond to what extent you agree as either very much so, moderately so, somewhat, or not at all. After completing the demographic questionnaire and pre-test STAI form, you will listen to five-minute pre-recorded violin music. After the listening task, you will be asked to complete the posttest State-Trait Anxiety Inventory for Adults (STAI) form.

Please click on the following link to sign-up to the study:

www.SignUpGenius.com/go/20F0F4AA4AF2AA7FF2-research1

If you would like additional information concerning this study, please feel free to contact us by phone or mail.

Sincerely,

Tsz Hei Fatima Chan, MT-BC
Principal Investigator
Division of MEMT
448 Murphy Hall
University of Kansas
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fatimachan@ku.edu

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Tsz Hei Fatima Chan, MT-BC

## APPENDIX C

## RECRUITMENT FLYER

**The University of Kansas**

**Division of Music Education and Music Therapy**

Principal Investigator: Tsz Hei Fatima Chan, B.M., MT-BC

Faculty Supervisor: Cynthia Colwell, Ph.D, MT-BC

**Purpose of Study:**

To determine the impact of the violin played with techniques specifically designed to simulate the human voice on anxiety reduction of college students during stressful events.

**Participation Criteria:**

- Age 18 years or older
- No hearing problems
- Enrolled as full-time student or with equivalent workload (i.e. teaching/research assistant)
- Have at least one scheduled oral or written examination or project presentation within the next 48 hours
- Involve in one of the following entities:
  - ❖ School of Music
  - ❖ Department of Special Education
  - ❖ Department of Psychology
  - ❖ International Student Services

**Expectation of Participants:**

- Complete a researcher-designed demographic questionnaire, a pre- and posttest State-Trait Anxiety Inventory for Adults (STAI)
- Listen to five-minute pre-recorded violin music

**Participation Time Needed:**

15 – 20 minutes

**Research Location:**

Murphy Hall – Room 578

**Research Dates:**

December 8, 2014 to December 18, 2014

**Sign-Ups:**

www.SignUpGenius.com/go/20F0F4AA4AF2AA7FF2-research1

**Contact Information:**

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## APPENDIX D

## DEMOGRAPHIC QUESTIONNAIRE

**DEMOGRAPHIC QUESTIONNAIRE**

* Please check the box that applies to you.

Sex: ☐ Male ☐ Female

Age: _____

Degree Major: _____

Degree Program: ☐ Undergraduate ☐ Graduate

Enrollment Status: ☐ Part-Time ☐ Full-Time

Within the next 48 hours, do you have:

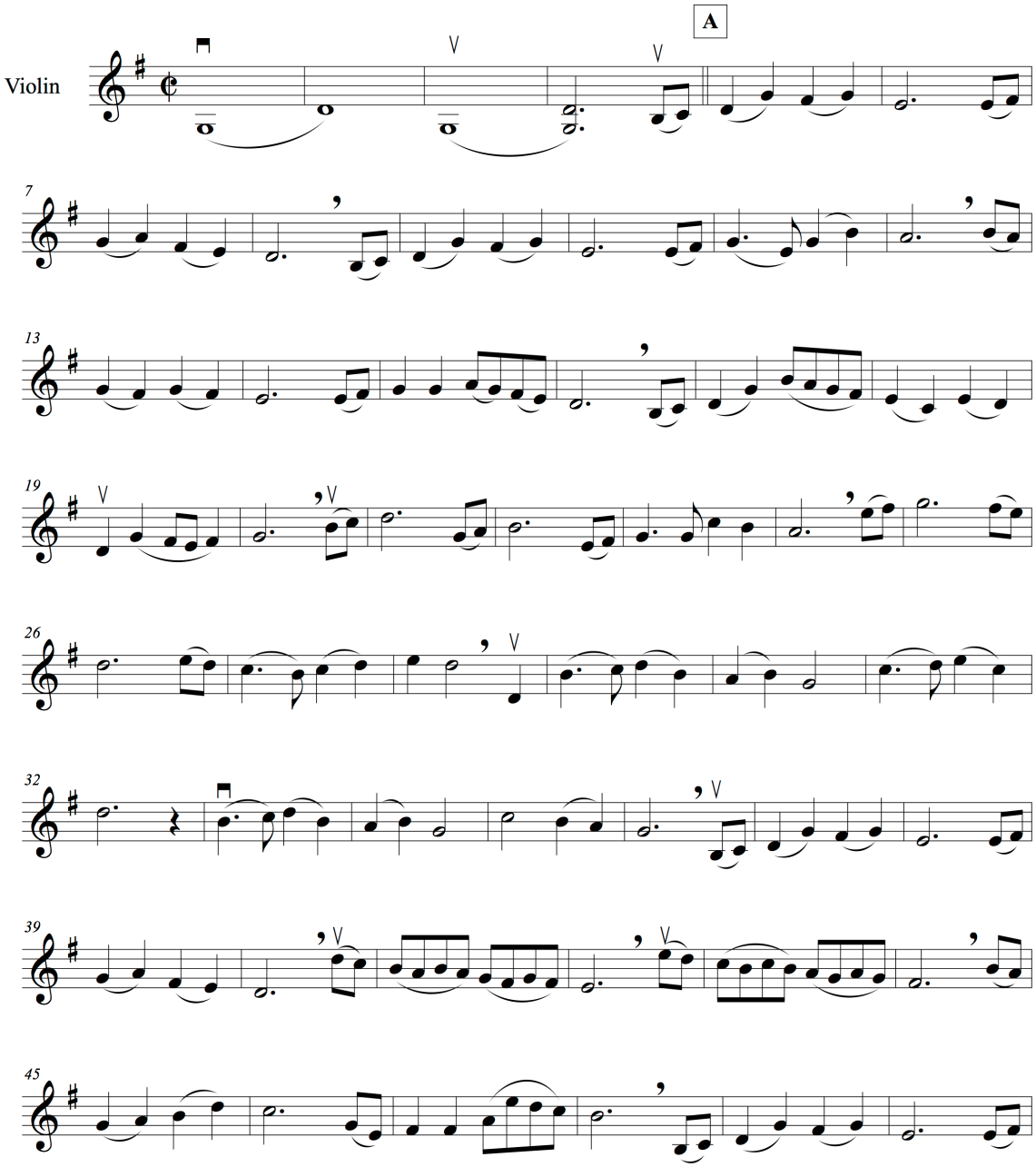
- An oral examination? ☐ Yes ☐ No
- A written examination? ☐ Yes ☐ No
- A presentation? ☐ Yes ☐ No

## APPENDIX E

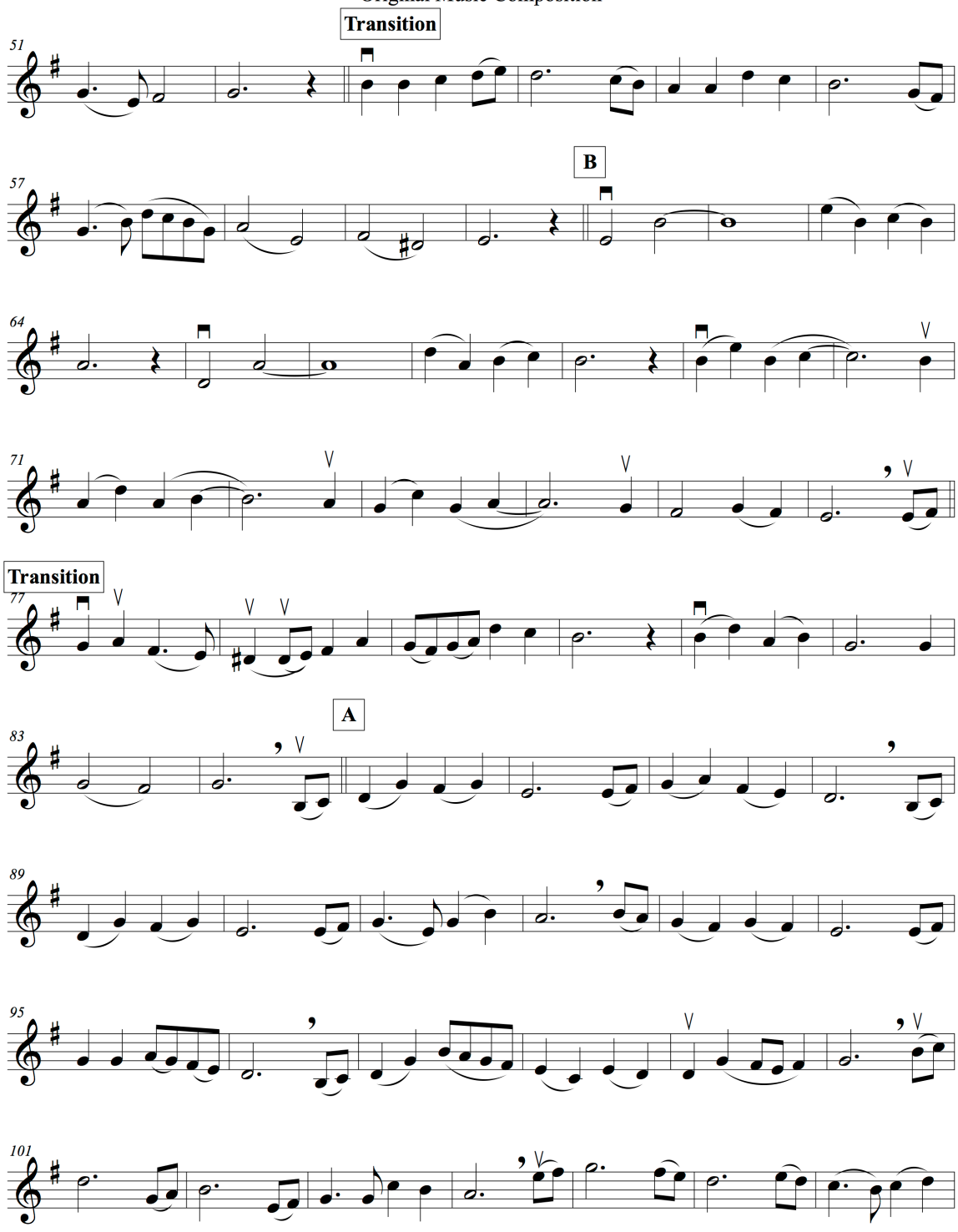
## ORIGINAL MUSIC COMPOSITION FOR RESEARCH STUDY

# Original Music Composition for Research Study

Tsz Hei Fatima Chan



Original Music Composition



Original Music Composition